REMARKS

Claims 1-31 were originally filed. Claims 1-19 have been withdrawn from consideration without prejudice or disclaimer. Claims 32-33 were previously added. Claims 20, 24, 26, 32, and 33 have been amended to clarify the nature of the present invention. Claim 27 has been cancelled. As a result, claims 20-26 and claims 28-33 are currently pending for examination, with claims 20 and 26 being independent claims. No new matter has been added and support for the amendments can be found throughout the specification as originally filed.

Summary of Telephonic Conference with the Examiner

Applicant thanks Examiner Hruskoci for the courtesy of a telephonic conference on July 8, 2004. During the telephonic conference, Applicant proposed the foregoing amendments to independent claims 20 and 26. Examiner Hruskoci requested a written submission including the proposed amendments and agreed to consider the amendments.

Rejections Under 35 U.S.C. § 102

Claims 20-25 have been rejected under 35 U.S.C. § 102(b) as being anticipated by the teaching of Crawford et al. in U.S. Patent No. 5,003,814 (Crawford et al.).

Applicant disagrees that the invention as recited in independent claim 20 is anticipated by the teaching of Crawford et al.

One aspect of the claimed invention pertains to continuous, on-line measurement of a rheological property to control the addition of a treatment agent into wastewater. Independent claim 20 has been amended to clarify the nature of the present invention by reciting the steps of continuously measuring an on-line rheological property of the wastewater stream and adjusting a

flowrate of the treatment agent based on the on-line rheological measurement. Support for this amendment can be found throughout the specification as originally filed, including, *inter alia*, FIG. 4, which shows continuous on-line viscosity (cP) as a function of polymer dose (g/kg biosolids). Further, the term continuous has been defined in the specification as filed to mean instantaneously, rapidly or repeatedly. (See for example page 6, lines 11-12.)

As noted in Applicant's Response previously filed on March 9, 2004, Crawford et al. teach a process for use in controlling the addition of conditioning material to sludge based on a comparison between unconditioned and conditioned sludge viscosity measurements. The sludge is directed to a sample vessel 36 (FIG. 1) equipped with a sensor head 46 that measures the shear stress of the sludge. Significantly, the process and apparatus disclosed by Crawford et al. divert the sludge stream for off-line, non-continuous measurements unlike the on-line measurement of a rheological property as claimed in the present invention. In short, Crawford et al. fail to teach a method that comprises a step of continuously measuring an on-line rheological property of the wastewater stream because it must divert, off-line, a portion of the unconditioned stream and a portion of the conditioned stream.

Also as noted in the previously filed Response, the present invention comprises continuously measuring an on-line rheological property. Crawford et al. disclose intermittent, non-continuous measurement by alternately measuring a viscosity of an unconditioned sludge sample and a viscosity of a treated sludge sample. That is, Crawford et al.'s method involves a sequence of off-line measurements requiring retrieving samples of both unconditioned and conditioned sludge. In contrast, the present invention adjusts the flowrate of conditioning material in response to a rheological measurement taken continuously, along the wastewater stream.

Significantly, the presently claimed continuous on-line measurement step distinctly differs from the Crawford et al. off-line measurement cycle. Crawford et al. state that a repetition period of 3 minutes or less, set by the operator, means that the apparatus samples repetitively. (See Crawford et al. at col. 8 lines 51-55.) However, repetition of a sequence of measurements is not the same as continuous measurement. Time intervals between rheological measurements, either scheduled or inherent in the process of alternating between unconditioned and conditioned sludge samples, cannot characterize continuous measurement of a rheological property as claimed. Crawford et al. teach a measurement cycle that does not allow for the accurate adjustment of flowrate in response to changes in a rheological property offered by the claimed method. (See, for example, Pickering et al. at col. 1, discussing the inherent disadvantages of off-line intermittent sampling and measurement techniques.) The techniques of the present invention overcome these disadvantages, as well as others, by performing continuous on-line measurements. Furthermore, Crawford et al. fail to recognize the benefits of continuous measurement, as evidenced by the recommendation of 30 minutes as a suitable upper limit for the off-line repetition period. (See Crawford et al. at col. 8 lines 55-56.) Clearly, Crawford et al. fail to teach continuous on-line measurement of a rheological property as recited in independent claim 20.

Therefore independent claim 20 cannot be anticipated by the teaching of Crawford et al. because the reference fails to disclose each and every limitation recited therein. Dependent claims 21-25 depend from independent claim 20. These claims further recite additional features of the claimed invention and are therefore patentable for at least the same reasons as discussed above.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejections under 35 U.S.C. § 102.

Rejections Under 35 U.S.C. § 103

Claims 26-33 have been rejected under 35 U.S.C. § 103(a) as being obvious over the teaching of Crawford et al., and further in view of the teachings of Pickering et al. in U.S. Patent No. 5,902,487 (Pickering et al.), and Bache et al. in a Water Resources publication (Bache et al.).

Applicant disagrees that claims 26-33 would have been obvious over the teaching of Crawford et al. and further in view of the teachings of Pickering et al. and Bache et al.

There is no teaching, suggestion, or motivation to combine the teachings of Pickering et al. and/or Bache et al. with the teaching of Crawford et al. in the manner asserted. Thus, there is no *prima facie* case of obviousness. Furthermore, any *prima facie* case of obviousness is rebutted because the teachings of the references diverge and, notably, conflict, thus undermining any expectation for success of the proposed combination.

Nonetheless, independent claim 26 has been amended to clarify that the claimed method comprises the steps of continuously measuring an on-line viscosity of the liquid-rich stream and adjusting a flowrate of the treatment agent based on the on-line viscosity. Support for this amendment can be found throughout the specification, including, *inter alia*, FIG. 2, which shows sensor 200 mounted on and fluidly connected to liquid-rich stream 140 as described on page 5 of the originally filed specification.

Crawford et al. disclose an off-line sampling process for measurement of viscosity prior to separation, as discussed above. Crawford et al. fail to teach or suggest continuously measuring an on-line viscosity of a liquid-rich stream.

Pickering et al. teach a process and apparatus for dewatering a suspension by measuring a density of the suspension and a flowrate of the suspension stream to calculate the amount of dosing conditioner to add. (See Pickering et al. at col. 4 lines 6-8.) Pickering et al. fail to teach or suggest continuously measuring an on-line viscosity of a liquid-rich stream. Significantly, Pickering et al. teach measuring density of the suspension on-line, prior to separation. (See Pickering et al. at col. 6 lines 34-35, col. 6 lines 56-60.) Pickering et al. fail to recognize the utility and advantages of post-separation measurement but instead emphasize that monitoring the performance of a process by analyzing the solids or liquids recovered from the process, post-separation, is difficult and unsatisfactory due to inherent feed back delays. (See Pickering et al. at col. 1 lines 47-65, col. 4 lines 33-38.) Thus, Pickering et al. teach away from post-separation measurement techniques as recited in independent claim 26.

Furthermore, Crawford et al. and Pickering et al. teach away from each other. Pickering et al. teach on-line measurement of density, in contrast to off-line measurement of viscosity as taught by Crawford et al. Pickering et al. state that off-line analysis, as taught by Crawford et al., is inconvenient. (See Pickering et al. at col. 1 lines 35-38.) Therefore, any prima facie case of obviousness is rebutted because one skilled in the art would not have sought to incorporate the teaching of Pickering et al. into the teaching of Crawford et al.

Significantly, Pickering et al. acknowledge a long-felt need exists by expressly noting unsuccessful prior attempts at continuously measuring viscosity of a liquid-rich stream. (See Pickering et al. at col. 2 lines 38-40.) The present invention provides a solution for this long-felt need by providing a method of treating wastewater comprising a step of continuously measuring an on-line viscosity of the liquid-rich stream. Thus, any *prima facie* case of obviousness is further rebutted.

Bache et al. seek to model the response of viscosity to polymer dosage by focusing on the quality of liquid-rich centrate. Bache et al. present a complex analytical scheme representing centrate viscosity as the linear sum of component terms including the viscosity contributions arising from turbidity, residual polymer and dissolved electrolytes. Bache et al. make no suggestion that measurements of centrate viscosity can be used to control the polymer dose added to a wastewater or sludge stream. That is, Bache et al. fail to recognize that viscosity measurements can be utilized to control the addition of a treatment agent. Moreover, Bache et al. fail to teach, suggest, or provide any motivation to perform on-line measurements of viscosity, to perform continuous viscosity measurement, or even to control the addition of a polymer based on a continuously measured on-line viscosity of the liquid rich stream.

There is no teaching, suggestion, or motivation to combine the teachings of Pickering et al. and/or Bache et al. with the teaching of Crawford et al. in the manner asserted. As discussed above, Pickering et al. and Crawford et al. also teach against, or at least fail to recognize the advantages associated with post-separation measurement techniques to characterize the nature of sludge centrate. Further, Pickering et al. teach measuring density, unlike Crawford et al. and Bache et al. None of the cited references provide a motivation to measure on-line viscosity of a liquid-rich stream. Therefore, because there is no *prima facie* case of obviousness, and any alleged *prima facie* case is rebutted, independent claim 26 would not have been obvious over the teaching of Crawford et al., and further in view of the teachings of Pickering et al. and Bache et al.

Dependent claims 27-33 depend from independent claim 26. These claims recite additional features of the claimed invention and are therefore patentable for at least the same reasons as discussed above.

In response to the comments made regarding claims 32 and 33, the polymer flowrate utilized in Crawford et al. is not adjusted to determine a minimum viscosity. Crawford et al. employ a minimum-seeking algorithm focused on minimizing polymer addition, not minimum viscosity. Crawford et al. also state that "even if all of the conditions for optimum operation are met the system will still always attempt to decrease the polymer flowrate by a small preselected amount." (See Crawford et al. at col. 8 lines 59- 63.) Notably, Crawford et al. teach a system that identifies a peak torque, i.e. a maximum viscosity, to establish a control signal for the rate of polymer addition. (See Crawford et al. at FIGS. 3 and 5 as well as at col. 8 line 57 to col. 10 line 58.) Thus, Crawford et al. fail to teach determining a minimum value of the on-line viscosity. The flowrate of polymer utilized in Bache et al. is also not adjusted for the purpose of obtaining a minimum viscosity. Instead, Bache et al. studied the response to various polymer dosages to analytically model the response of centrate viscosity and to characterize the contribution of additional variables in general. Thus, none of the references teach varying or adjusting a flowrate of a treatment agent to determine a minimum value of the on-line viscosity and certainly none of the references recognize the inventiveness of associating a measured, on-line minimum viscosity as an optimal operating characteristic.

Therefore, none of the references teach, suggest or provide any motivation for a method of treating wastewater as recited in dependent claims 32 or 33.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejections under 35 U.S.C. § 103.

CONCLUSION

In view of the foregoing Amendments and Remarks, this application is in condition for allowance. A notice to this effect is respectfully requested. If the Examiner believes that this application is not in condition for allowance, Applicant respectfully requests that the Examiner call Applicant's representative at the telephone number listed below.

If this Response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant requests any necessary extension of time.

No fee is due. If there is any other fee occasioned by this Response, including an extension fee that is not covered by the enclosed check, please charge any deficiency to Deposit Account No. 50/0214.

Respectfully Submitted,
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